found in the specification on page 29 at lines 26-28. The amendment relating to "at least 4.5 volume percent" aromatics is supported by Tables 2 and 5 (on specification pages 15 and 23, respectively) wherein blend AR3951-10 in Table 2 is shown to contain 4.5 volume percent aromatics, and all other fuels listed in both tables contain greater amounts of aromatics. Similarly, claim 234 is amended, as supported by blend AR3951-15 of Table 2, to require at least 9.5 vol.% aromatics, with there being a multitude of gasolines in Tables 2 and 5 having values above 9.5 vol.%.

The net effect of the present amendment is to exclude from use in the invention a fuel having any of:

(1) a paraffin content of 50 vol.% or less

(2) a paraffin content more than 95.5 vol.%

(3) an aromatics content of 50 vol.% or more or

(4) an aromatics content less than 4.5 vol.%

Stated in scientific shorthand, the broadest possible ranges for paraffins and aromatics are:

$$50 \text{ vol.\%} < \text{paraffins} \leq 95.5 \text{ vol.\%}$$

$$4.5 \text{ vol.\%} \leq \text{aromatics} < 50 \text{ vol.\%}$$

These limitations serve to simplify consideration of this application and to further distinguish the invention over the art. For example, although Fuel 5 of CRC 486 (as described in IDS No. 9, page 12) was not a gasoline suitable for combustion in an automobile because it caused "severe driveability problems" and "excessive swelling of rubber parts in the carburetors," the present limitations offer explicit and clear distinction over Fuel 5. In particular, Fuel 5 has a 41 vol.% paraffin content whereas the present amendment requires the gasolines of the invention to have greater than 50 vol.% paraffins. Another fuel not a gasoline suitable for combustion in an automobile is, as applicants' attorney explained in the interview,

dual component fuel B of SAE 780612 in Table 2, which fuel B contained no aromatics and required 19 seconds of crank time in order to start the engine. (See Table 7.) The present amendment further distinguishes over this fuel by requiring at least 4.5 vol.% aromatics in the gasolines for use in the invention. Moreover, the present limitations serve to further distinguish the invention over blending components used to make an automotive gasoline, e.g., alkylates.

For the convenience of the Examiner, the following table sets forth the required properties of the unleaded gasolines of the two pending independent claims after the present amendment. (An extra, loose copy of the table is provided herewith for the Examiner's use.)

TABLE

Properties of Unleaded Gasolines Required in Independent Claims 181 and 195 After Amendment dated September 15, 1995 in Jessup et al., SN 08/409,074 filed March 22, 1995.

Combustion Ind. Claim	RVP	T_{10}	T_{50}	T_{90}	Olefin	Paraffin	Octane	Oxygenate Required	Aromatics
181(a)	<7	≤158	≤215	≤315		>72	≥87	No	≥4.5
181(b)	<7	≤158	≤215	≤315		>65	≥87	No	≥4.5
181(c)	<7	≤158	<193	≤315	<10	>50	≥87	No	≥4.5
181(d)	<7	≤158	≤215	≤315	< 1	>50	≥87	No	≥4.5
181(e)	<7	≤158	≤215	<300	<10	>65	≥87	No	≥4.5
195(a)	<7.5	≤158	≤215	≤315	<10	>50	≥87	Yes	≥4.5
195(b)	<7	≤158	≤215	≤315		>65	≥87	Yes	≥4.5
195(c)	<7	≤158		≤315		>70	≥87	Yes	≥4.5
195(d)	<7	≤158	≤215	≤315	<10	>50	≥87	Yes up to 14.9% MTBE	≥4.5

Finally, applicants' attorney expresses his appreciation for the time and the attention the Examiner gave to considering this case during the interview. A summary of the interview by applicants' attorney will soon be prepared and submitted to the USPTO.

An allowance is most respectfully requested.

Respectfully submitted,

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08/409074

Appendix XXX

Aviation Fuels

Applicants have made of record in the present application a number of documents and arguments pertaining to aviation fuels, in particular aviation gasolines of designation 80/87. Among these materials are the following:

(1) **U.S. Patent 2,204,215** issued to Greensfelder et al.

(2) **"Petroleum Refinery Engineering"** by W. L. Nelson

Both of the foregoing references were submitted with IDS No. 3, and are discussed therein in the "Overview" section on page 5 and in Section A on pages 16-17. (For ease in finding the Greensfelder and Nelson references among the many of record, the Examiner is directed to the three-ring binder identified as "Patents and Miscellaneous References" submitted with IDS No. 3, in which the Greensfelder and Nelson references are identified by white tabs 2 and 12, respectively.)

(3) **U.S. Patent 2,593,561** issued to Herbst et al., submitted with IDS No. 4 and discussed on page 6 thereof. (This patent may be conveniently found in the three-ring binder submitted with IDS No. 4 and entitled "References Accompanying Information Disclosure Statement #4" at tab no. 3.)

(4) **Unocal Refinery Data** pertaining to Aviation gasolines of designations 80/87 and 100/130, submitted with IDS No. 5 and identified therein as Attachments M and N, respectively.

(5) "Aviation Fuels," Chapter 5 of **Manual on Significance**

of Tests for Petroleum Products: 5th Edition" ed. George V. Dryoff, submitted with IDS No. 5 and identified therein as Attachment O. The Unocal refinery data and Attachment O are discussed in Section C of IDS No. 5 at pages 2 to 4.

The Examiner is asked to review the foregoing documents and discussions of record in the locations identified above in conjunction with the following references submitted with this IDS No. 9 and the discussion to follow:

(A) **U.S. Patent 2,209,204** issued to McCulloch et al.

(B) **"Aviation Fuels, 1983" Niper 134**, (April 1984)

(C) The May 1965 issue of Mineral Industrial Surveys entitled **"Aviation Fuels, 1964"**

(D) The March 1970 issue of Mineral Industrial Surveys entitled **"Aviation Fuels, 1969"**

As was discussed in IDS No. 5, aviation gasolines, due to their low RVP and distillation characteristics needed for high altitude environments, have properties similar to the fuels required in the method of the invention presently claimed. In addition, such fuels are ordinarily highly paraffinic, and in this property, again, aviation gasolines are similar to many of the gasolines required in the method of the invention claimed.

The most **usual** aviation gasoline is both leaded and un-oxygenated, the "leaded" property being needed to provide the required octane value and protect the engine valve seats from excessively wearing (see Attachment O of IDS No. 5 at page 52, 1st column, first full paragraph) and the "un-oxygenated" requirement to prevent failure of rubberized components (seals, gaskets, etc.) and/or detrimentally increasing the water-holding capacity of the fuel. (See Attachment O of IDS No. 5 at page 51, 2nd column,

paragraph 5.)

Thus, the usual aviation fuels will be both leaded and un-oxygenated. Having said that, however, the prior art includes a few references which, taken arguendo at face value, show aviation fuels containing either added oxygenate or no lead, or both. Thus, **to the extent the Examiner may have predicated any PTO action on the belief that aviation gasolines are necessarily excluded from one or more of the fuels required in the claims at issue because they are <u>always</u> unleaded and/or non-oxygenated (whether such belief was caused by anything argued by applicants, or otherwise), the Examiner is notified that further examination of this case may be required. Likewise, to the extent the Examiner may not have appreciated the high paraffinic nature of aviation gasolines and predicated any PTO action thereon, again she is notified that further examination of this case may be required.** In making the foregoing statements, it is to be understood that applicants in no way concede that the fuels recited in their method claims are not novel or obvious over the prior art. In fact, applicants reiterate their position that such claimed fuels are novel and non-obvious, but are now asking the Examiner to review the issue herself in light of the "aviation fuel" information previously presented plus that now presented, as follows:

1. Lead

The vast majority of aviation fuels contain lead. However, references (A) through (D) above, as well as Unocal's refinery data of IDS No. 3, Attachment M, page M-2, report, whether accurately or otherwise, Aviation Grade 80/87 gasolines containing no lead or low lead. The Examiner is asked carefully to review page M-2 as well as references (A) through (D), and to note

McCulloch's teachings regarding aviation blends containing no added lead (e.g., page 2, col. 1, lines 47-50) as well as the following specific fuels reported to have no lead or low lead:

"Aviation Fuels, 1983" Niper 134 at pages 6-7, in Table 2: **items 2 and 6**

Aviation Fuels, 1964, page 12, Table 6: **items 4, 7, 9, 13 & 17**

Aviation Fuels, 1969, page 6, Table 2, **items 1, 5, 9, 10 & 18**

The Examiner is cautioned that the lead data of these documents may not necessarily be accurate. Note, for example, that one fuel (item 9 of Aviation Fuels, 1969) is reported to contain 0.01 ml/gal TEL yet at the same time contain a lead precipitate of 0.1 mg/100 ml. In any event, if leaded or not, the fuels of the method claims herein are still submitted to be novel and non-obvious, for reasons associated with oxygenate content, paraffin content, octane value, as well as the very nature of "gasoline" itself, as will now be discussed.

2. Oxygenate

Standard aviation gasolines do not contain oxygenates and indeed are composed entirely of hydrocarbons "except for trace amounts of approved additives." (See IDS No. 5, Attachment O, page 46.) Needless to say, oxygenates are not among the approved additives, probably for the reasons pointed out in Attachment O of IDS No. 5 at page 52, i.e., oxygenates could attack rubberized components and/or increase the water-holding capacity of the fuel.

Nevertheless, the 1940 McCulloch patent does disclose a fuel for aviation purposes containing an oxygenate. Extremely noteworthy, however, is that McCulloch never refers to his fuel as a **gasoline**, referring to it instead as a "motor fuel" or "motor

fuel blend." The reason McCulloch does not refer to his fuel as a gasoline is most probably due to the inordinate amount of oxygenate (isopropyl ether) in his fuel, e.g., 25-44.5 vol.%, as shown the data on page 2, column 2 in his Examples 1 and 2.

The Examiner is asked to review McCulloch's data on page 2, column 2, with respect to fuels of Examples 1 and 2, and to consider the RVP and distillation data in comparison to the fuels of applicants' claims. It is applicants' position that the fuels of the method claims at issue are novel and non-obvious over McCulloch's teachings at least for the reason that McCulloch's blends are never described as "gasolines," and one skilled in the art would not consider McCulloch's aviation motor fuel blends to be "gasolines" due to large oxygenate content (25 - 45.5 vol%).

In construing the word "gasoline" as used in the claims, the primary sources are the patent specification itself and authoritative scientific usage. The patent specification discloses (on page 8, line 26, to page 9, line 2) that

> "[g]asolines are well known fuels, generally composed of a mixture of hydrocarbons boiling at atmospheric pressure in a very narrow temperature range, e.g., 77° F. (25° C.) to 437° F. (225° C.). Gasolines are typically composed of mixtures of aromatics, olefins and paraffins, although some gasolines may also contain such added non-hydrocarbons as alcohol (e.g., ethanol) or other[1] oxygenates (e.g., methyl tertiary butyl ether). Gasoline may also contain various additives, such as detergents, anti-icing agents, demulsifiers, corrosion inhibitors, dyes, deposit modifiers, as well as octane enhancers such as tetraethyl lead.

Consistent with applicants' definition is one found on page 773 in Modern Petroleum Technology, 5th Edition, Part II, Hobson ed., pp. 773-5 & 815-7 (1984) attached hereto as Attachment XXX-1:

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[1] Note that "other" was added by amendment received by the USPTO on April 28, 1994.

> Motor gasoline has, until recent years, consisted almost entirely of a complex mixture of hydrocarbons derived from crude oil and boiling between about 30° C and 220° C, i.e. containing compounds in the range C4 to C12. Today, in some gasolines and in some countries, alcohols and other oxygenated compounds are also used as blending components or even as motor fuels in their own right . . . Small amounts of additives are usually incorporated in order to enhance various performance aspects of the fuel . . ."

In the same publication on page 815 it is taught that blend components for gasoline are normally used in the range of 3 to 15%, with the most commonly used such blend materials being alcohols and ethers. These definitions require gasoline to be an essentially hydrocarbon mixture, with at most only a small amount of oxygen present by way of an added (or blended) oxygenate--not the inordinate 25 - 45.5 vol.% of McCulloch.

3. Paraffin Content

Most modern aviation gasolines contain little or no olefins, due to their gum-forming tendencies. And while the presence of aromatics in aviation gasolines is tolerated, the amount is normally not as high as in automotive gasolines. (See Attachment O of IDS No. 5 at page 51, paragraph 4.) As a result, aviation gasolines are usually highly paraffinic, and some can be virtually 100% paraffinic.

Nevertheless, in the absence of analytical data measuring the aromatics/olefin/paraffin content of a given aviation gasoline of uncertain composition, the actual amount of paraffins, olefins, and aromatics in the fuel would be unknown.[2] This is the case for the fuels described in (1) "Aviation Fuels, 1983" Niper 134 in Table 2, (2) Aviation Fuels, 1964, page 12, Table 6, (3) Aviation

[2] Even knowing that high gravity values, e.g., 70 or above, is indicative of high paraffin values provides no resolution to this problem, since gravity is only a rough guide as to paraffin content.

Fuels, 1969, page 6, Table 2, and (4) Attachment M of IDS No. 3. Thus, the novelty of the fuels recited in applicants' method claims over these documents is evident by the fact that there are no data in these references disclosing the aromatics, olefin, and paraffin contents of the fuels described therein whereas every fuel of the claims at issue has either a paraffin or olefin requirement, or both.

As to the McCulloch patent (Reference A listed above), while motor fuel blends A through D contain only isopentane and iso-octane in addition to the ether, the three-component blend can hardly be considered a gasoline. Similarly, McCulloch's fuel blends E through H in Example 2 are not gasolines and, in any event, have an uncertain paraffin content depending upon the degree of hydrogenation of the polymer.

4. Octane Value

Another difficulty in comparing aviation gasolines to the automotive gasolines required in applicants' method claims is the fact that octane value is not calculated in the same manner. (See Attachment O on page 51, paragraph 1, of IDS No. 5.) Thus, whereas the fuels of applicants' claims require an octane value of at least 87 based on (R + M)/2, the octane values for aviation gasolines are not comparable. For this additional reason, the no lead or low lead gasolines in Niper 134, Aviation Fuels, 1964, Aviation Fuels, 1969, and Attachment M of IDS No. 5 do not anticipate any of the gasoline fuels required in applicants' method claims.

In light of the foregoing, the applicants submit that the gasoline fuels of their method claims at issue are novel and non-obvious over the aviation fuels of record.

TABLE

Properties of Unleaded Gasolines Required in Independent Claims 181 and 195 After Amendment dated September 15, 1995 in Jessup et al., SN 08/409,074 filed March 22, 1995.

Combustion Ind. Claim	RVP	T_{10}	T_{50}	T_{90}	Olefin	Paraffin	Octane	Oxygenate Required	Aromatics
181(a)	<7	≤158	≤210	≤315		>72	≥87	No	≥4.5
181(b)	<7	≤158	≤210	≤315		>65	≥92	No	≥4.5
181(c)	<7	≤158	<193	≤315	<10	>50	≥87	No	≥4.5
181(d)	<7	≤158	≤210	≤315	< 1	>50	≥87	No	≥4.5
181(e)	<7	≤158	≤210	<300	<10	>50	≥87	No	≥4.5
195(a)	<7.5	≤158	≤215	≤315	<10	>65	≥87	Yes	≥4.5
195(b)	<7	≤158	≤215	≤315		>65	≥87	Yes	≥4.5
195(c)	<7	≤158		≤315		>70	≥87	Yes	≥4.5
195(d)	<7	≤158	≤215	≤315	<10	>50	≥87	Yes up to 14.9% MTBE	≥4.5

Extra Copy of page 7 for EXAMINER'S Use